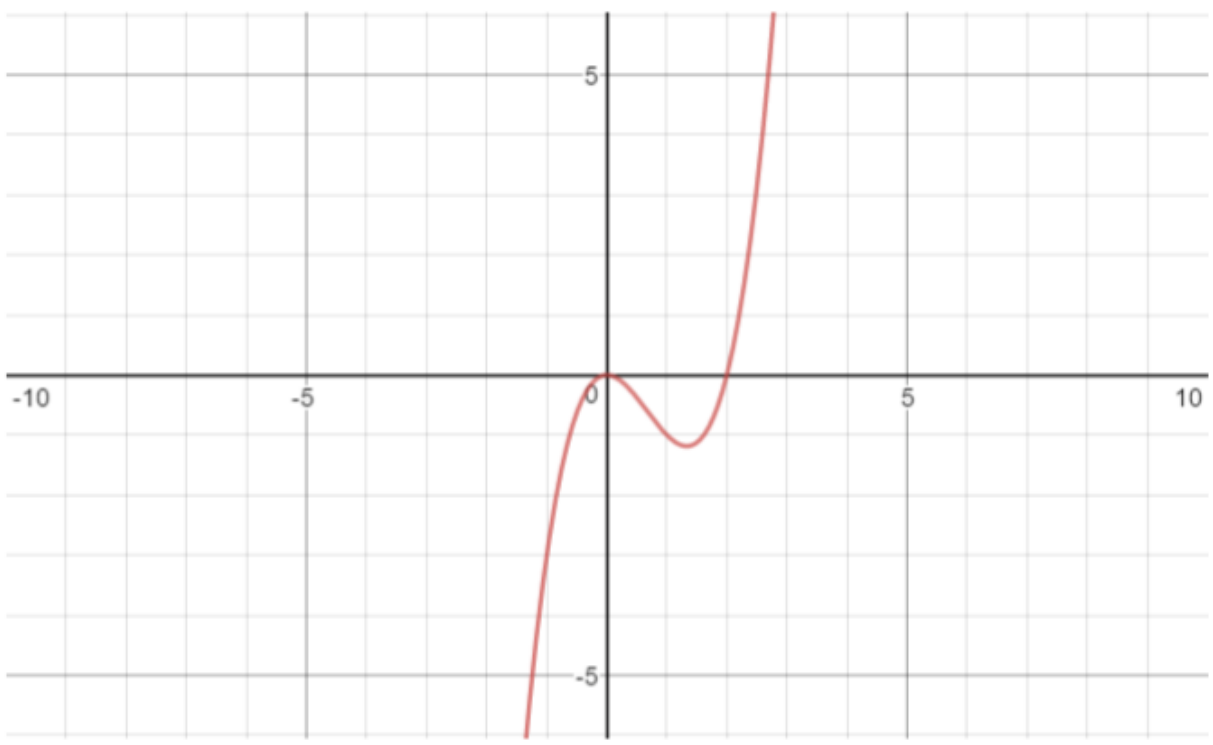
Topic: Horizontal line test

Question: This is a graph of $y = x^3 - 2x^2$. Which of these describes the relation?



Answer choices:

A Not a function

B A function, but not 1-to-1

C A 1-to-1 function

D An exponential function

© Krista King Math

Solution: B

A look at the graph tells us that there's no vertical line that intersects the graph in more than one point, so the relation is a function.

On the other hand, it's easy to find a horizontal line that intersects the graph at more than one point, which indicates that the function is not 1-to-1. The x-axis is one example.

© Krista King Math

Topic: Horizontal line test

Question: Which function below is not 1-to-1?

Hint: Picture the graph if you can, or use the method $f(a) = f(b)$ implies $a = b$ to show that the function is one to one.

Answer choices:

A $j(x) = \sqrt{x + 2}$

B $g(x) = 7x - 2$

C $h(x) = (x - 2)(x + 3)$

D $f(x) = \dfrac{x + 7}{x + 5}$

© Krista King Math

Solution: C

Answer choice A: $j(x) = \sqrt{x+2}$

Use the method $j(a) = j(b)$ implies $a = b$.

$$\sqrt{a+2} = \sqrt{b+2}$$

$$a + 2 = b + 2$$

$$a = b$$

That worked, so $j(x)$ is a one-to-one function.

Answer choice B: $g(x) = 7x - 2$

This is a simple linear function with a slope of 7, so a horizontal line will intersect it in only one point, and $g(x)$ is a 1-to-1 function.

Answer choice C: $h(x) = (x-2)(x+3)$

This can be written as $h(x) = x^2 + x - 6$, a quadratic function. The graph will be a parabola that opens upward. A horizontal line will intersect the parabola at two points, so $h(x)$ is not 1-to-1.

Answer choice D: $f(x) = (x+7)/(x+5)$

Use the method $f(a) = f(b)$ implies $a = b$.

© Krista King Math

$$\frac{a+7}{a+5}=\frac{b+7}{b+5}$$

$$(a+7)(b+5)=(b+7)(a+5)$$

$$ab+5a+7b+35=ab+5b+7a+35$$

$$7b-5b=7a-5a$$

$$2a=2b$$

$$a=b$$

That worked, so $f(x)$ is a 1-to-1 function.

© Krista King Math